

IGCSE Biology 0610 (2026-2028) Revision

Notes: Topic 20 Human Influences on Ecosystems

These notes are structured to cover all learning objectives for Topic 20: Human Influences on Ecosystems in the Cambridge IGCSE Biology 0610 syllabus for examinations from 2026 to 2028.

20.1 Food Supply

Humans have developed various methods to increase food production to meet the demands of a growing global population.

Methods to Increase Food Production

Method	Description	Effect on Food Production
Agricultural Machinery	Use of tractors, harvesters, etc.	Allows for farming of larger areas of land with higher efficiency and reduced labour.
Chemical Fertilisers	Addition of nitrates, phosphates, and potassium to the soil.	Improves yields by providing essential mineral ions for healthy plant growth.
Insecticides	Chemicals used to kill insect pests.	Improves quality and yield by preventing pests from eating or damaging crops.
Herbicides	Chemicals used to kill weeds.	Reduces competition from weeds for light, water, and mineral ions, increasing crop yield.
Selective Breeding	Choosing organisms with desirable traits to breed.	Improves crop and livestock production (e.g., higher yield, disease resistance, faster growth).

Large-Scale Monocultures

A **monoculture** is the cultivation of a single crop over a large area.

Advantages	Disadvantages
Efficiency: Easier to manage, sow, and harvest using machinery.	Reduced Biodiversity: Only one species of plant is grown, reducing the variety of other species (insects, birds, etc.).
High Yields: Optimised for a single high-yielding crop variety.	Increased Disease Risk: If a pathogen attacks the crop, the entire field is vulnerable, leading to massive crop loss.
Specialisation: Farmers can become experts in that one crop.	Soil Depletion: Continuous growth of the same crop depletes specific soil nutrients.

Intensive Livestock Production

Intensive livestock production involves keeping a large number of animals in confined spaces, often indoors, to maximise output.

Advantages	Disadvantages
High Yield: Maximises meat, milk, or egg production per unit area.	Ethical Concerns: Animals are kept in unnatural, crowded, and sometimes stressful conditions.
Lower Cost: Reduced costs for land and labour.	Increased Disease Risk: High density of animals allows diseases to spread rapidly.
Controlled Environment: Temperature and feeding are controlled for optimal growth.	Pollution: Produces large amounts of animal waste (manure) which can pollute local water sources.

20.2 Habitat Destruction

Biodiversity is defined as the **number of different species** (plants, animals, microorganisms) living in a specific area.

Causes and Effects of Habitat Destruction

Habitat destruction is the leading cause of species becoming endangered or extinct.

Cause of Destruction	Description
Expansion	Clearing land for housing, crops, and livestock farming.
Extraction of Natural Resources	Mining, quarrying, and logging destroy habitats.
Freshwater and Marine Pollution	Pollutants destroy aquatic habitats, killing or harming species.

Deforestation Deforestation is the cutting down of trees on a large scale.

Undesirable Effect	Explanation
Reduced Biodiversity	Loss of trees destroys the habitat and food source for countless species, leading to species loss and extinction .
Soil Loss (Erosion)	Tree roots bind the soil. Without them, heavy rain washes the topsoil away, leading to barren land.
Flooding	Trees intercept rainfall and their roots absorb water. Deforested land cannot absorb water, increasing surface runoff and the risk of flooding.
Increased Atmospheric CO₂	Trees act as carbon sinks (absorbing CO ₂ for photosynthesis). Cutting them down and burning them releases stored carbon back into the atmosphere, contributing to the enhanced greenhouse effect and climate change .

Altering Food Webs and Food Chains: The removal of a single species (e.g., through habitat loss or overfishing) can have a dramatic, negative impact on an entire ecosystem, as it disrupts the flow of energy and nutrients in the **food web** and **food chain**.

20.3 Pollution

Water Pollution

Pollutant	Source	Effect on Aquatic Ecosystems
Untreated Sewage	Domestic and industrial waste.	Contains pathogens and organic matter. Decomposition of organic matter by bacteria uses up dissolved oxygen, killing fish and other aquatic organisms.
Excess Fertiliser	Runoff from agricultural land.	Causes eutrophication (see below).

Eutrophication (The Process): Eutrophication is the process by which a body of water becomes overly enriched with nutrients, leading to a chain of events:

1. **Increase in ions:** Excess nitrates and other ions from fertilisers or sewage enter the water.
2. **Rapid Producer Growth:** These nutrients cause a rapid growth of producers, such as algae (**algal bloom**).
3. **Decomposition after Death:** The algae die and sink to the bottom.
4. **Increased Aerobic Respiration:** Decomposers (bacteria) feed on the dead algae, increasing their rate of **aerobic respiration**.
5. **Reduction of Dissolved Oxygen:** The decomposers use up the dissolved oxygen in the water.
6. **Death of Aquatic Organisms:** Fish and other aquatic organisms requiring oxygen die due to the lack of dissolved oxygen.

Land and Air Pollution

Pollutant	Source	Effect
Non-biodegradable Plastics	Domestic and industrial waste.	Aquatic Ecosystems: Animals (e.g., turtles, birds) ingest or become entangled in plastic, leading to injury or death. Terrestrial Ecosystems: Litter and soil contamination.
Methane (CH₄)	Rice fields, cattle farming, landfill sites.	A potent greenhouse gas that traps heat in the atmosphere, contributing to the enhanced greenhouse effect and climate change .
Carbon Dioxide (CO₂)	Burning of fossil fuels, deforestation.	The main greenhouse gas from human activity, contributing to the enhanced greenhouse effect and climate change .

20.4 Conservation

Sustainable Resource: A **sustainable resource** is one that is produced as rapidly as it is removed from the environment, ensuring that the resource **does not run out**.

Causes of Endangerment and Extinction

Organisms become endangered or extinct due to:

- **Climate Change:** Changes in temperature and rainfall patterns.
- **Habitat Destruction:** Loss of natural living areas.
- **Hunting and Overharvesting:** Unsustainable removal of animals or plants.
- **Pollution:** Contamination of air, water, and land.
- **Introduced Species:** Non-native species out-compete or prey on native species.

Reasons for Conservation Programmes

Conservation is necessary to:

- **Maintain or increase biodiversity:** Protect the variety of life on Earth.

- **Reduce extinction:** Prevent species from dying out.
- **Protect vulnerable ecosystems:** Preserve unique and fragile habitats.
- **Maintain ecosystem functions:** Ensure essential services like **nutrient cycling** and resource provision (e.g., food, drugs, fuel, genes) continue.

Conservation Strategies

Area	Conservation Method	Description
Endangered Species	Monitoring and Protection	Tracking populations and protecting them from poaching or habitat loss.
	Education	Raising public awareness about the importance of species.
	Captive Breeding Programmes	Breeding endangered animals in zoos or reserves to increase numbers for reintroduction.
	Seed Banks	Storing seeds from various plant species to preserve genetic diversity.
Forests	Education	Teaching about the importance of forests and sustainable practices.
	Protected Areas	Designating national parks or reserves where logging is forbidden.
	Quotas	Limiting the amount of timber that can be legally harvested.
	Replanting	Replacing felled trees with new ones (afforestation).
Fish Stocks	Education	Promoting sustainable fishing practices.
	Closed Seasons	Banning fishing during breeding seasons.
	Protected Areas	Establishing marine reserves where fishing is prohibited.
	Controlled Net Mesh	Using nets with a large enough mesh size to allow young fish to escape and mature.
	Quotas	Limiting the total amount of fish that can be caught.

	Monitoring	Tracking fish populations to ensure they are sustainable.
--	-------------------	---

Captive Breeding Techniques

- **Artificial Insemination (AI):** Sperm is collected from a male and manually inserted into a female. This is useful when animals are separated or refuse to mate.
- **In Vitro Fertilisation (IVF):** Eggs are fertilised by sperm outside the body (in a lab) and the resulting embryos are implanted into a surrogate mother.

Risk of Reduced Genetic Variation: Small populations, often resulting from conservation efforts, have **reduced genetic variation**. This is a risk because:

- The population is less able to adapt to **environmental changes** (e.g., a new disease or climate change).
- Inbreeding can occur, leading to an increased chance of offspring inheriting harmful recessive alleles.

Notes compiled by Manus AI, based on the Cambridge IGCSE Biology 0610 Syllabus (2026-2028).

References

[1] Cambridge International Education. (2023). *Cambridge IGCSE Biology (0610) Syllabus for examination in 2026, 2027 and 2028*. Retrieved from <https://www.cambridgeinternational.org/Images/697203-2026-2028-syllabus.pdf>